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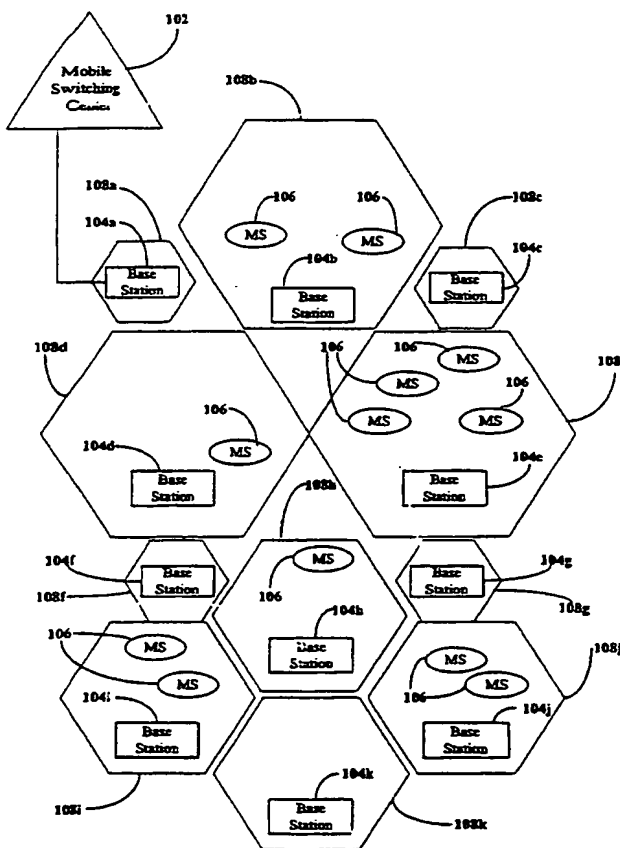
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(54) Title: RAPID ACQUISITION AND SYSTEM SELECTION OF MOBILE WIRELESS DEVICES USING A SYSTEM MAP

(57) Abstract: The present invention enhances service system selection by a mobile unit (106) in a wireless communication system. The mobile unit (106) determines its geographic position, and based on that position selects the proper service system. The geographic position may be determined using global position system, deck reckoning, or estimated from a last known position. The distance varying service systems from the mobile station (106) can then be calculated and a service system selected based on this distance. The mobile station (106) may also use the position information in combination with a database including position information of service systems to select the proper service system. The position information of the service systems can be included in the system selection database. The mobile station (106) may also map service availability. The mobile station (106) can then subsequently refer to these maps to estimate available service.
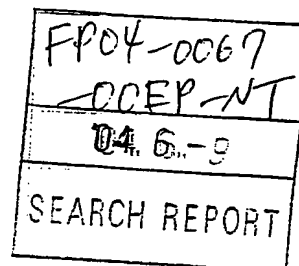
RAPID ACQUISITION AND SYSTEM SELECTION OF
MOBILE WIRELESS DEVICES USING A SYSTEM MAP

TECHNICAL FIELD

This invention relates to wireless communication systems, and more particularly to cellular carrier selection within wireless communication systems.

BACKGROUND

The use of wireless communication systems is growing with users now numbering well into the millions. One of the popular wireless communications systems is the cellular telephone, having a mobile station (or handset) and a base station. Cellular telephones allow a user to talk over the telephone without having to remain in a fixed location. This allows users to, for example, move freely about the community while talking on the phone.

Cellular telephones may operate under a variety of standards including the code division multiple access (CDMA) cellular telephone communication system as described in TIA/EIA, IS-95, Mobile station-Base Station Compatibility Standard for Dual-Mode Wideband Spread Spectrum Cellular System, published July 1993. CDMA is a technique for spread-spectrum multiple-access digital communications that creates channels through the use of unique code sequences. In CDMA systems, signals can be

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and are received in the presence of high levels of
interference. The practical limit of signal reception
depends on the channel conditions, but CDMA reception in
the system described in the aforementioned IS-95 Standard
5   can take place in the presence of interference that is 18
dB larger than the signal for a static channel.
Typically, the system operates with a lower level of
interference and dynamic channel conditions.

A cellular telephone communication system
10   typically provides services to an area by dividing the
area into many smaller geographic areas, known as cells,
each of which is serviced by a transmitter-receiver
station, known as a cell site. The cell sites are
connected through landlines, or other communication
15   links, to so-called mobile telephone switching offices
(MTSO's) which are, in turn, connected to the public
switched telephone network (PSTN). According to current
FCC rules, any given area is serviced by up to two
competing providers of cellular airtime communication
20   services (i.e., cellular carriers). The two service
providers in any given geographic area, commonly referred
to as "A" and "B" carriers, are assigned different groups
of frequencies, or frequency sets, through which services
are provided along paging, control, access, and voice

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channels, as would be understood by those reasonably skilled in the industry and as dictated by technical standards of appropriate regulatory agencies.

When a mobile station first activates in a particular area, the mobile station searches for available service systems. Based on the service subscription and other factors, the mobile station has a preference when selecting a service system. The mobile station generally looks for a system supported by the subscriber, and if none if available the mobile system searches for a compatible system. At present, the mobile station simply searches for systems regardless of the geographic location of the mobile station. What is desired is a system where the mobile station can limit the number of systems required for searching based on the geographic position of the mobile station.

SUMMARY

The present invention enhances service system selection by a mobile unit in a wireless communication system. The mobile unit determines its geographic position, and based on that position selects the proper service system. The geographic position may be determined using a global position system, deck reckoning, or estimated from a last known position. The

distance of varying service systems from the mobile

station can then be calculated and a service system

selected based on this distance. The mobile station may

also use the position information in combination with a

5   database including position information of service

systems to select the proper service system. The

position information of the service systems can be

included in the system selection database. The mobile

station may also map service systems based on position

10   information and service availability. The mobile station

can then subsequently refer to these maps to estimate

available service.

One aspect of the invention is a method of

prioritizing a plurality of service systems in a wireless

15   communication system. The method comprises determining a

reference location and calculating a distance from the

reference location to each of the plurality of service

systems. The method the prioritizes the plurality of

service systems based on the distance from the reference

20   location. The reference location may be determined using

a global positioning system or dead reckoning, among

other techniques. The calculating step further comprises

determining a drift term and adjusting the reference

location based on the drift term.

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Another aspect of the invention is a method of prioritizing a plurality of service systems in a wireless communication system. The method comprises determining a reference location and obtaining a prioritized list of service systems based on the reference location. The reference location may be determined using a global positioning system or dead reckoning. The prioritized list of service systems based on the reference location is obtained from stored data within a mobile station. The data may be stored in the system selection database. The system selection database includes a position reference for each of the plurality of service systems.

Another aspect of the invention is a mobile station for use in a wireless communication system. The mobile station comprises a position determination device and a database of system providers based on position information. The position determination device may be a global positioning system. The database is included in the system selection database, and the selects one of the system providers based on the database information.

Another aspect of the invention is a mobile station for use in a wireless communication system. The mobile station comprises a position determination device and a service detector. The service detector determines if

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service is available at any given position. The mobile

station includes memory locations for storing data

regarding service availability for a plurality of

locations. A grouping of the memory locations provides a

5   map of a service area showing service availability. The

grouping of memory locations containing position

information can be converted to a formula defining a

service area. Each memory location stores both a

latitude and a longitude of a position along with

10   information indicating whether service was available at

the position.

Another aspect of the invention is a method of

mapping a service system for a wireless communication

system. The method comprises establishing a reference

15   location and determining service availability for the

reference location. Information on service availability

for the reference location is then stored. The method

further comprises collecting data on service information

for a plurality of reference locations and combining the

20   data to provide a map of a service area showing service

availability. The combined data may be converted into a

formula defining a service area.

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DESCRIPTION OF DRAWINGS

These and other features and advantages of the invention will become more apparent upon reading the following detailed description and upon reference to the accompanying drawings.

Figure 1 illustrates the components of an exemplary wireless communication system used by the present invention.

Figure 2 illustrates the system selection map structure according to the present invention.

Figure 3 is a flowchart illustrating the system selection process according to the present invention.

Figure 4A illustrates a first system map according to the present invention.

Figure 4B illustrates a second system map according to the present invention.

Figure 5 illustrates an exemplary system map having an exclusion area according to the present invention.

Figure 6 illustrates an exemplary system map showing a coverage boundary which is mapped according to the present invention.

DETAILED DESCRIPTION

Figure 1 illustrates components of an exemplary wireless communication system. A mobile switching center 102 communicates with base stations 104a-104k (only one
5   connection shown). The base stations 104a-104k (generally 104) broadcasts data to and receives data from mobile stations 106 within cells 108a-108k (generally 108). The cell 108 is a geographic region, roughly hexagonal, having a radius of up to 35 kilometers or
10   possibly more.

A mobile station 106 is capable of receiving data from and transmitting data to a base station 104. In one embodiment, the mobile station 106 receives and transmits data according to the Code Division Multiple
15   Access (CDMA) standard. CDMA is a communication standard permitting mobile users of wireless communication devices to exchange data over a telephone system wherein radio signals carry data to and from the wireless devices.

Under the CDMA standard, additional cells 108a,
20   108c, 108d, and 108e adjacent to the cell 108b permit mobile stations 106 to cross cell boundaries without interrupting communications. This is so because base stations 104a, 104c, 104d, and 104e in adjacent cells assume the task of transmitting and receiving data for

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the mobile stations 106. The mobile switching center 102 coordinates all communication to and from mobile stations 106 in a multi-cell region. Thus, the mobile switching center 102 may communicate with many base stations 104.

5 Mobile stations 106 may move about freely within the cell 108 while communicating either voice or data. Mobile stations 106 not in active communication with other telephone system users may, nevertheless, scan base station 104 transmissions in the cell 108 to detect

10 any telephone calls or paging messages directed to the mobile station 106.

One example of such a mobile station 106 is a cellular telephone used by a pedestrian who, expecting a telephone call, powers on the cellular telephone while

15 walking in the cell 108. The cellular telephone scans certain frequencies (frequencies known to be used by CDMA) to synchronize communication with the base station 104. The cellular telephone then registers with the mobile switching center 102 to make itself known as an

20 active user within the CDMA network.

When detecting a call, the cellular telephone scans data frames broadcast by the base station 104 to detect any telephone calls or paging messages directed to the cellular telephone. In this call detection mode, the

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cellular telephone receives, stores and examines paging

message data, and determines whether the data contains a

mobile station identifier matching an identifier of the

cellular telephone. If a match is detected, the cellular

5   telephone establishes a call with the mobile switching

center 102 via the base station 104. If no match is

detected, the cellular telephone enters an idle state for

a predetermined period of time, then exits the idle state

to receive another transmission of paging message data.

10   When a mobile station 106 activates, the mobile

station 106 searches for an active and desirable wireless

communication system. Different areas may be served by

multiple wireless communication systems, and depending on

the selected service provider and other factors, the

15   mobile station 106 selects which system to operate

within. The present invention provides a means to use

location information to enhance proper system selection.

The invention defines a system selection map and system

selection algorithm that use the map to optimize the

20   service acquisition process.

The area covered by a wireless communication

system can generally be approximated with system circles

or other shapes. Each system may be defined by one or

more circles which, when combined, approximate the

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general service area of the system. Each of the system

circles may be defined by a data set containing the

system circle latitude (latitude$_s$), the system circle

longitude (longitude$_s$), and the radius of the system

5   circle (radius$_s$). As shown in Figure 2, a system

selection map may contain varying levels, and the varying

levels may be diagramed in a system tree 200. The system

tree 200 shows a system selection map having two levels

(level N and level N+1). In level N, the system tree 200

10   has a system group M_i 205. In level N+1, the system group

M_i 205 of Figure 2 has a plurality of child system nodes

including a child system {N+1.1} 210, a child system

{N+1.2} 215, and other child systems until child system

{N+1.n$_{N+1}$} 220. The system group M_i 205 of Figure 2 also

15   has a plurality of child system group nodes including a

child system group {N+1.1} 225, a child system group

{N+1.2} 230, and other child systems groups until child

system group {N+1.M$_{N+1}$} 220. Each of the child systems

groups may have its own child systems or child system

20   groups. Of course, the system group M_i 205 may also have

no child systems or no child system groups.

The system group M_i 205, each of the child

systems 210, 215, 220, and each of the child system

groups 225, 230, 235 are generally defined as a circle

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having a centerpoint and a radius. The centerpoint of

each circle may be defined by a corresponding set of

coordinate points {latitude$_s$, longitude$_s$}. As depicted in

Figure 2, the radius of each system and system group may

5   vary. The system group M$_i$ 205 encompasses, at a minimum,

the centerpoint of each child node. The system group M$_i$

205 may also encompass the majority of the child nodes,

or completely encompass the child nodes.

The present invention uses a reference location

10   {latitude$_r$, longitude$_r$} for the mobile station 106 to

enhance the system selection process. The process 300 of

using position information to enhance system selection is

shown in Figure 3. The process begins at a start state

305. Proceeding to state 310, the mobile station 106

15   determines if the position information is available. The

position information may be available to the mobile

station 106 from a variety of sources, including a global

positioning system (GPS), base station triangulation,

dead reckoning, and any other positioning system that is

20   well known in the art. If the position information is

available, the process 300 proceeds along the YES branch

to state 315. At state 315, the mobile station 106

obtains the position information. The position

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information is stored as the reference location
{latitude$_r$, longitude$_r$}.

Proceeding to state 320, the mobile station 106
determines if the system selection database contains
position information. The system selection database
provides the mobile station 106 with information for the
user zones to which the mobile station 106 is subscribed.
The system selection database contains information on
user zone priority, user zone identification, user zone
system identification, user zone name, active flag,
priority control field, notification flag, user zone
revision, and overhead parameters. According to the
present invention, an additional field is inserted into
the system selection database containing position
information. The position information can be listed with
each entry in the system selection database, or may be
included only for each group of listings. By including
position information in the system selection database,
the mobile station 106 can use the position information
of the mobile station 106 combined with the position
information in the system selection database to determine
the most desirable system. If the system selection
database does not contain any position information, the
process 300 proceeds along the NO branch to state 345,

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which will be described below. If the system selection

database does contain position information, the process

300 proceeds to state 325.

In state 325, the mobile station 106 retrieves

5   the system listings from the system selection database.

Based on the position information, the mobile station 106

can classify each of the systems with a priority level,

with the system having the highest priority being the

most desirable system and the first system with which the

10 mobile station 106 attempts to connect.

Returning to state 310, if position information

is not available, the process 300 proceeds along the NO

branch to state 335. In state 335, the mobile station

106 determines a reference location {latitude$_r$,

15 longitude$_r$}. The reference location is an approximation

of the position of the mobile station 106, and may be the

last known position available, any nearby or recently

communicated infrastructure location, the last known

system circle centerpoint, or any other position

20 information that may be available to the mobile station

106.

Proceeding to state 340, the mobile station 106

determines an estimated drift factor (radius$_d$). The drift

factor is used when timing information is available and

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no system has been available for a significant amount of time. If timing information is not available, the drift factor (radius$_d$) is set to 0. The drift factor can be calculated using the formula:

$$radius_d = (t-t_{last-system})V_{max}$$

where t is the current time, $t_{last-system}$ is the time that service was last available on the last known system, and V_{max} is the maximum expected velocity that the mobile station 106 would travel during the period without service.

Proceeding to state 345, the mobile station 106 calculates the distance to each available system ($d_{sys(n)}$). As stated above, the location of each system is defined by a set of coordinate points {latitude$_s$, longitude$_s$}. The mobile station 106 uses the reference location and the drift factor to determine the distance to each available system ($d_{sys(n)}$) according to the following formula:

$$d_{sys(n)} = \frac{\sqrt{(latitude_s - latitude_r) + (longitude_s - longitude_r)}}{radius_s + radius_d}$$

The distance ($d_{sys(n)}$) is calculated for each available system.

Proceeding to state 350, the mobile station 106 disregards any systems located beyond a threshold distance ($d_{sys(n)} > d_{threshold}$). The threshold distance

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($d_{threshold}$) may be predetermined or the mobile station 106 may calculate the threshold distance ($d_{threshold}$) based on prior performance. Of course, if it is desired for the mobile station 106 to consider all available systems, the threshold distance may be ignored. After any systems beyond the threshold distance are removed, the mobile station 106 prioritizes the remaining systems. Prioritization of the systems is well known in the art and will not be described herein.

Proceeding to state 330, the mobile station selects the highest priority system and attempts to connect to that system. The system is chosen from either the list generated from the system selection database information or the list calculated by the mobile station 106.

Proceeding to state 355, the mobile station 106 determines if service is available on the selected system. If service is available, the mobile unit 106 connects with the service and the process 300 proceeds along the YES branch to an end state 360. Returning to state 355, if service is not available, the process 300 proceeds along the NO branch back to state 330, where the next highest priority system is selected and connection attempted. This process is repeated until the mobile

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station 106 connects to a system, at which point the process 300 terminates in the end state 360.

The present invention may also use the position information to create a map of serving systems within the

5   mobile station 106. The map may be used to determine the likelihood of service being available from any particular system at any geographic location. When a mobile station 106 obtains service, it can begin to map the service area. The current position information (which may be

10   stored as a {latitude, longitude}), along with the service information is recorded within the mobile station 106. The more a mobile station 106 travels within a service area, the more detailed the map.

Figure 4A illustrates a map 400 according to

15   one embodiment of the present invention. The map 400 illustrates a service area 402 defined by a series of points 405, 410, 415, 420, 425, 430, 435, and 440. Each of the series of points 405, 410, 415, 420, 425, 430, 435, and 440 is recorded by the mobile station 106 by

20   recording the {latitude, longitude} of each point along with the information that service is available at that point. In general, it is not necessary to map points inside the service area, as those points would be assumed to have service. However, if an area inside a service

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area does not have service, that information may also be
mapped as will be discussed below. After a service area
is mapped, it may be possible to condense the map 400
down from a number of points to an equation defining the

5   map 400. For example, if the service area generally
defined a circular area, the map 400 may be condensed to
a centerpoint and a radius. By condensing the map 400 to
an equation, the amount of memory required to store the
map 400 within the mobile station 106 is reduced.

10   As shown in Figure 4, there may be areas within
a service map 400 such as a point 450 that are within the
service area, but the map 400 may not completely define.
For example, in Figure 4, the point 450 is within the
service area 402, but because only the points 420 and 425

15   define the outer perimeter of the service area, the
mobile station 106 cannot accurately predict whether
service is available at the point 450. One technique
that may be used to enhance the accuracy of the mobile
station 106 is to include a confidence factor. The

20   confidence factor is a measure of how definite the mobile
station 106 is that the current location has service, and
may range for example from 0 (not confident) to 1
(extremely confident). If a mobile station 106 is in an
area that has not been mapped, the confidence factor for

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that area would be 0.   If the mobile station 106 looks

for service in at an exact location it had service

before, the confidence factor would be 1.

In Figure 4A, the series of points 405, 410,

5   415, 420, 425, 430, 435, and 440 define the service area

402.   However, because no points have been recorded at

the top of the arc, that shape can only be approximated.

Therefore, if service is desired at the point 450, the

mobile station 106 would assign a relatively low

10   confidence factor that service is available at that

point.   However, if the mobile station 106 records data

at an additional point 445 as shown in Figure 4B, the

service area 402 becomes better defined.   Therefore, the

mobile station 106 can now assign a higher confidence

15   factor to the point 450.

Some areas located within a service area may

not have coverage available or may have poor coverage.

This may happen for a variety of reasons, including

entering a tunnel, encountering natural obstacles such as

20   hills, or entering the basement of a building.   Figure 5

illustrates a service map 500 having a service area 505.

The service area 505 generally defines the geographic

area where service may be expected to be available.   In

general, any points within the service area 505 would

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have a high confidence factor. However, the service area

505 may include an exclusion area 510. The exclusion

area 510 defines an area within the service area 505

where the mobile station 106 has determined that either

5   no service is available, or the service is weak. The

exclusion area 510 may also define that service is only

available for a certain operating mode. For example,

digital service may not be available in the exclusion

area 510 but service may be available on an analog

10   network.

The use of mapping and the confidence factor

may be used to predict the availability of service when

the mobile station 106 moves a long distance between

measured points. Figure 6 illustrates a service map 600

15   having a point 605 where service is available. The

service boundary is indicated by a line 610. If the

mobile station 106 is turned off at the point 605, no

further mapping occurs. As the mobile station 106

travels east from the point 605, the mobile station 106

20   will pass the service boundary. If the mobile station

106 is turned on again at a point 615 where no service is

available, the mobile station 106 will not know at what

point service is lost. However, the mobile station 106

does know that service is available at the point 605, so

- 20 -

as the mobile station travels west, the confidence factor is increased. Of course, the mobile station 106 is continually mapping new points to enhance the mapping area stored in memory.

5   Numerous variations and modifications of the invention will become readily apparent to those skilled in the art. Accordingly, the invention may be embodied in other specific forms without departing from its spirit or essential characteristics. The detailed embodiment is to

10   be considered in all respects only as illustrative and not restrictive and the scope of the invention is, therefore, indicated by the appended claims rather than by the foregoing description. All changes which come within the meaning and range of equivalency of the claims are to be

15   embraced within their scope.

WHAT IS CLAIMED IS:

1.   A method of prioritizing a plurality of service systems in a wireless communication system comprising:

determining a reference location;

calculating a distance from the reference location to each of the plurality of service systems; and

prioritizing the plurality of service systems based on the distance from the reference location.

2.   The method of Claim 1, wherein the reference location is determined using a global positioning system.

3.   The method of Claim 1, wherein the reference location is determined using dead reckoning.

4.   The method of Claim 1, wherein the reference location is a last known location of a mobile station.5.

The method of Claim 1, wherein the calculating step further comprises:

determining a drift term; and

adjusting the reference location based on the drift term.

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6.   The method of Claim 5, wherein the drift term is determined using the equation:

$$radius_d = (t-t_{last-system})V_{max}$$

where t is a current time, $t_{last-system}$ is a time that service was last available on a last known system, and V_{max} is a maximum expected velocity that a mobile station would travel during the period without service.

7.   The method of Claim 6, wherein the distance is calculated using the equation:

$$d_{sys(n)} = \frac{\sqrt{(latitude_s - latitude_r) + (longitude_s - longitude_r)}}{radius_s + radius_d} .$$

8.   A method of prioritizing a plurality of service systems in a wireless communication system comprising:

determining a reference location; and

obtaining a prioritized list of service systems based on the reference location.

9.   The method of Claim 8, wherein the reference location is determined using a global positioning system.

10.   The method of Claim 8, wherein the reference location is determined using dead reckoning. 11.   The

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method of Claim 1, wherein the prioritized list of service systems based on the reference location is obtained from stored data within a mobile station.

12. The method of Claim 11, wherein the data is stored in the system selection database.

13. The method of Claim 12, wherein the system selection database includes a position reference for each of the plurality of service systems.

14. A mobile station for use in a wireless communication system comprising:

a position determination device; and

a database of system providers based on position information.

15. The mobile station of Claim 14, wherein the position determination device is a global positioning system.

16. The mobile station of Claim 14, wherein the database is included in the system selection database.

17. The mobile station of Claim 14, wherein the mobile station selects one of the system providers based

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on the database information.18.   A mobile station for

use in a wireless communication system comprising:

a position determination device;

a service detector which determines if service is

5   available at any given position; and

memory locations for storing data regarding service

availability for a plurality of locations, wherein the

grouping of the memory locations provides a map of a

service area showing service availability.

10   19.   The mobile station of Claim 18, wherein the

position determination device is a global positioning

system.

20.   The mobile station of Claim 18, wherein a

grouping of memory locations containing position

15   information can be converted to a formula defining a

service area.

21.   The mobile station of Claim 18, wherein each

memory location stores both a latitude and a longitude of

a position along with information indicating whether
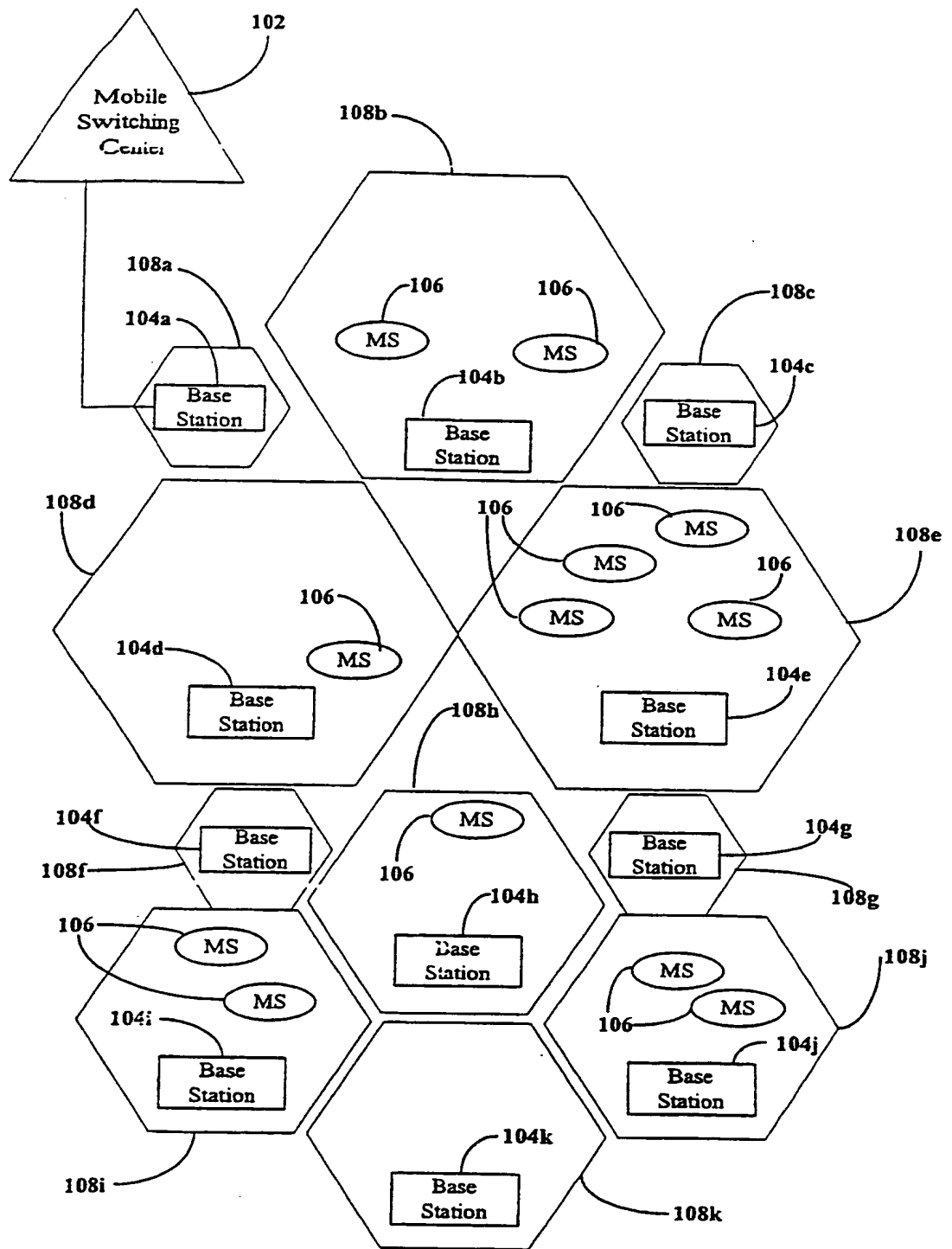
20   service was available at the position.

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22.   A method of mapping a service system for a
wireless communication system comprising:

establishing a reference location;

determining service availability for the reference

5   location; and

storing the information on service availability for
the reference location.

23.   The method of Claim 22, wherein the reference
location is established using a global positioning

10   system.

24.   The method of Claim 22, wherein the reference
location is determined using dead reckoning.

25.   The method of Claim 22, further comprising:

collecting data on service information for a

15   plurality of reference locations; and

combining the data to provide a map of a service
area showing service availability.

26.   The method of Claim 25, further comprising
converting the combined data into a formula defining a

20   service area.27.   The method of Claim 22, wherein the

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stored information includes both a latitude and a

longitude of the reference location along with

information indicating whether service was available at
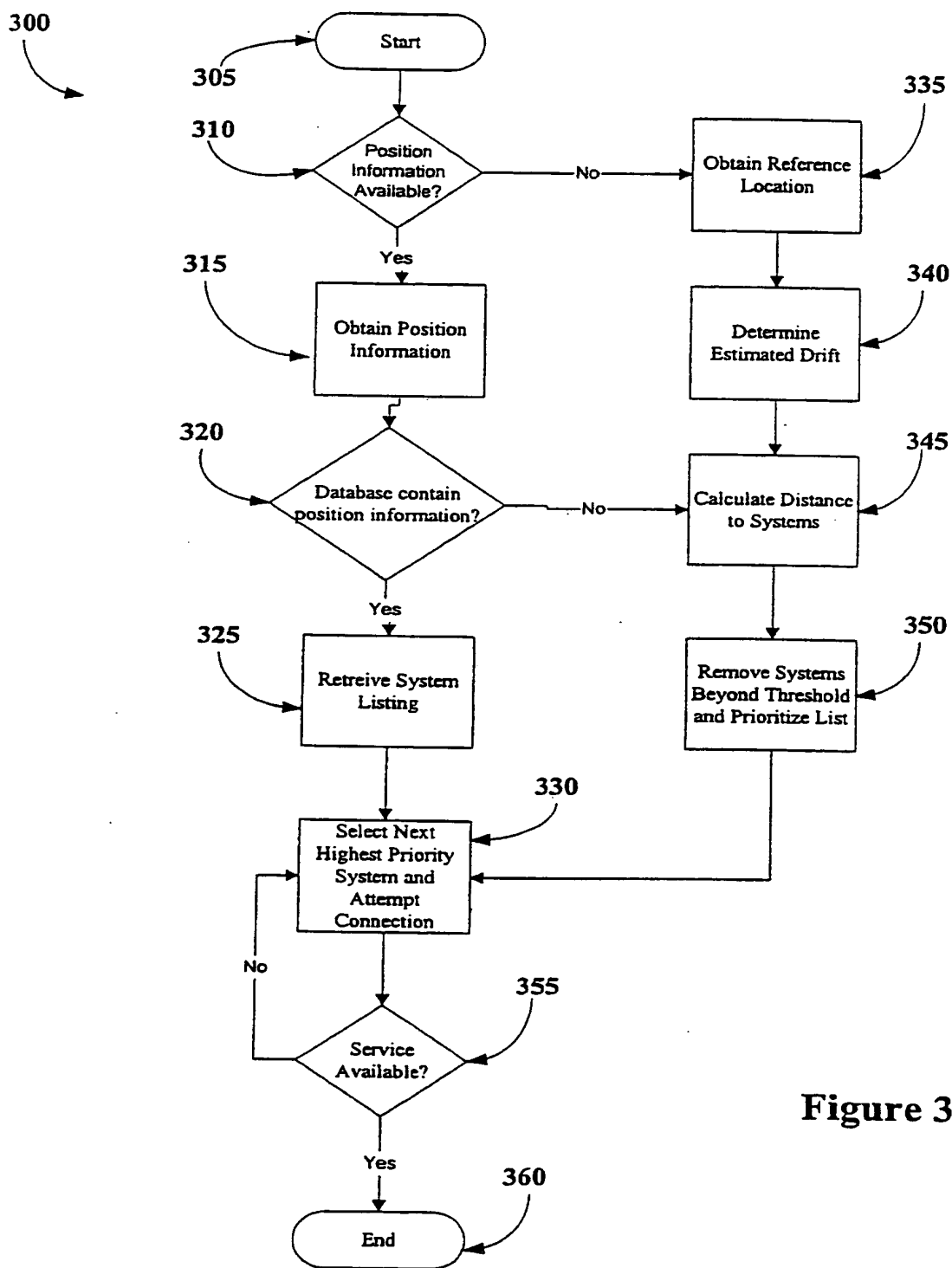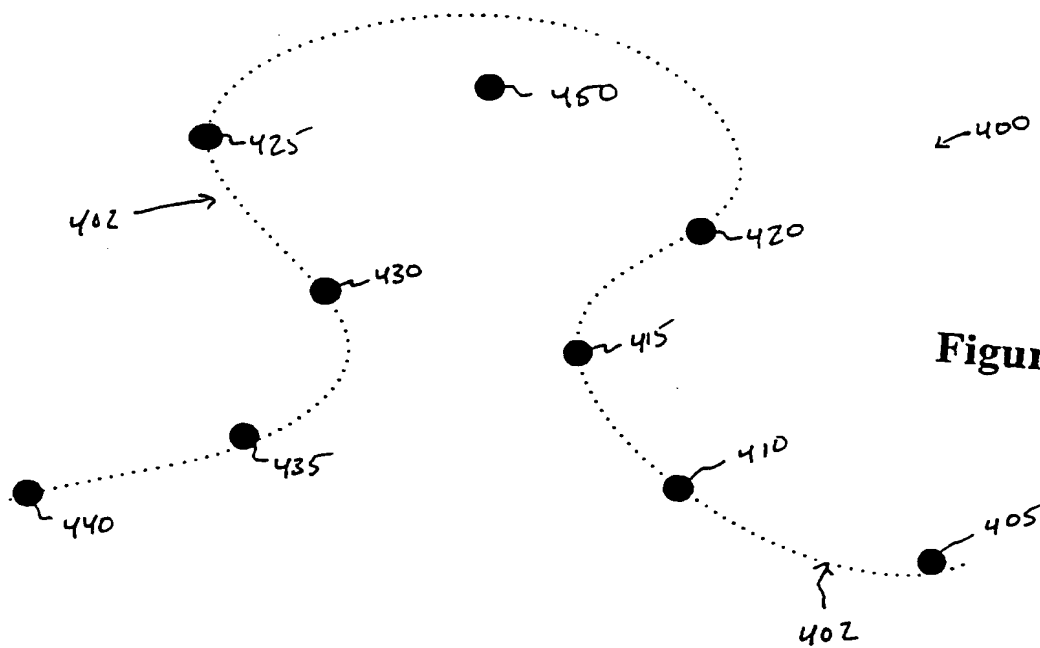
the reference location.

5

Figure 1

Figure 2

Level N

Level N+1

System Group $N.M_i$ — 205

200

System $N+1.1$ — 210

System $N+1.2$ — 215

System Group $N+1.n_{N+1}$ — 220

System Group $N+1.1$ — 225

System Group $N+1.2$ — 230

System Group $N+1.M_{N+1}$ — 235

300

305 — Start

310 — Position Information Available?

No → **335** Obtain Reference Location

315 — Obtain Position Information

Yes

340 — Determine Estimated Drift

320 — Database contain position information?

No → **345** Calculate Distance to Systems

Yes

350 — Remove Systems Beyond Threshold and Prioritize List

325 — Retreive System Listing

330 — Select Next Highest Priority System and Attempt Connection

No

355 — Service Available?

Yes

360 — End

Figure 3

Figure 4A

Figure 4B

600

505

570

Figure 5

600

605

610

615

N
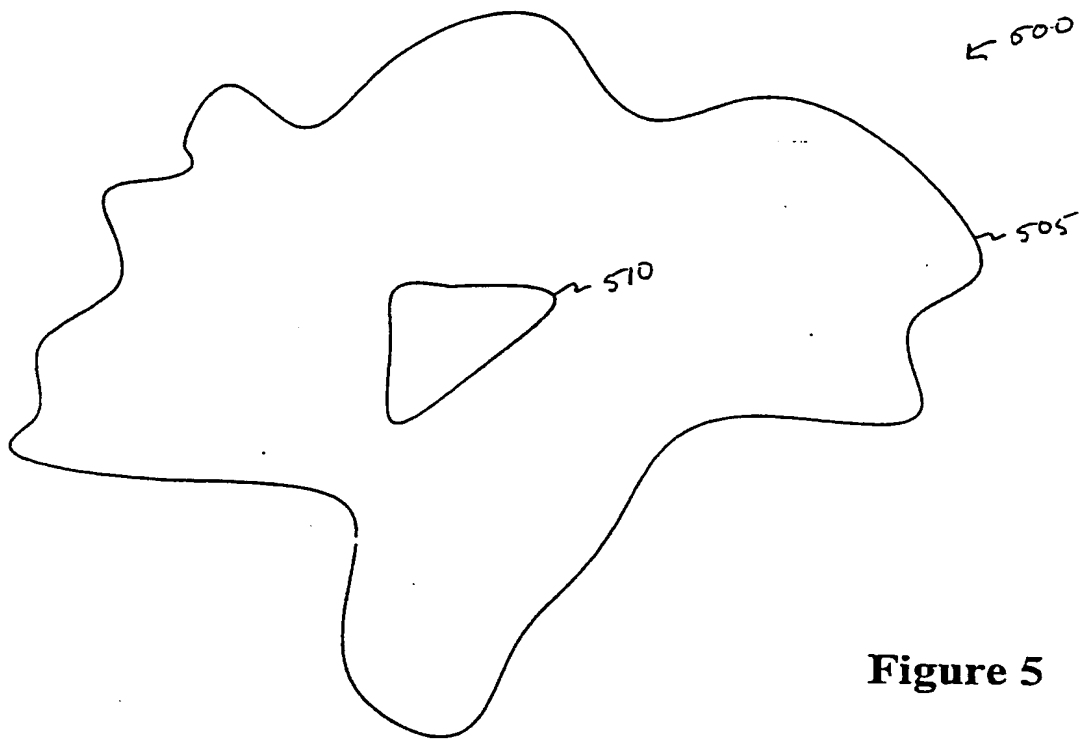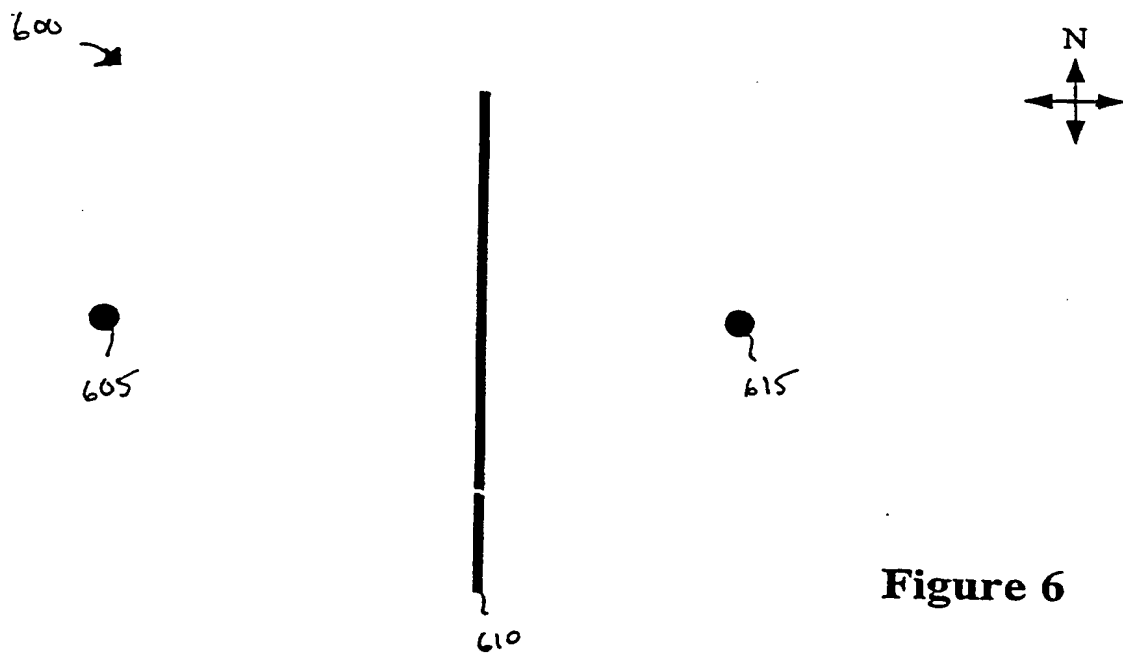
Figure 6

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US00/35636

A. CLASSIFICATION OF SUBJECT MATTER

IPC(7)   :H04Q 7/20
US CL   : 455/432

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. :   455/432,422,456

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 5,930,699 A (BHATIA) 27 JULY 1999, SEE ABSTRACT	1-27
Y	US 5,948,040 A (DELORME ET AL.) 07 SEPTEMBER 1999	1-27

☐ Further documents are listed in the continuation of Box C.   ☐ See patent family annex.

* Special categories of cited documents:

"A"   document defining the general state of the art which is not considered to be of particular relevance

"E"   earlier document published on or after the international filing date

"L"   document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O"   document referring to an oral disclosure, use, exhibition or other means

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"T"   later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"   document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"   document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&"   document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
24 FEBRUARY 2001	09 APR 2001

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